CLAIMS

What is claimed is:

1. A method for forming a dielectric comprising:
forming a first dielectric layer over semiconductor material;
introducing a diffusion barrier material into the first dielectric layer; and
forming a second dielectric layer over the first dielectric layer after the introducing.

2. The method of claim 1 wherein the diffusion layer material includes nitrogen.

3. The method of claim 1 wherein the second dielectric layer is a relatively higher K dielectric than the first dielectric layer.

4. The method of claim 1 wherein the introducing further includes:
performing plasma processing of the diffusion barrier material into the first dielectric layer.

5. The method of claim 1 wherein the introducing further includes:
implanting the diffusion barrier material into the first dielectric layer.

6. The method of claim 1 wherein the introducing further includes:
performing a thermal anneal of material including the diffusion barrier material into the first dielectric layer.

7. The method of claim 1 wherein the semiconductor material includes silicon.

8. The method of claim 7 wherein the semiconductor material includes at least one of single crystal silicon, strained silicon, or silicon germanium.

9. The method of claim 1 wherein the first dielectric layer includes silicon oxide.

10. The method of claim 1 wherein the first dielectric layer includes at least one of germanium oxide and silicon germanium oxide.

11. The method of claim 1 wherein the second dielectric layer includes silicon nitride.

12. The method of claim 1 wherein the second dielectric layer includes at least one of one of germanium nitride and silicon germanium nitride.

13. The method of claim 1 wherein the second dielectric layer includes a high K dielectric.

14. The method of claim 1 wherein the high K dielectric includes at least one of a metal oxide, a metal silicate, a metal oxynitride, and a metal silicon oxynitride.

15. The method of claim 14 wherein:

the metal oxide includes at least one of hafnium oxide, aluminum oxide, lanthanum oxide, titanium oxide, and tantalum oxide;

the metal silicate includes at least one of hafnium silicate, aluminum silicate, lanthanum silicate, titanium silicate, and tantalum silicate;

the metal oxynitride includes at least one of hafnium oxynitride, aluminum oxynitride, lanthanum oxynitride, titanium oxynitride, and tantalum oxynitride; and

the metal silicon oxynitride includes at least one of hafnium silicon oxynitride, aluminum silicon oxynitride, lanthanum silicon oxynitride, titanium silicon oxynitride, and tantalum silicon oxynitride.

16. The method of claim 1 wherein after the introducing, the diffusion material has a gradual gradient profile in the first dielectric layer.

17. The method of claim 1 wherein after the introducing, a bottom portion of the first dielectric layer has lower concentration of the diffusion barrier material than an upper portion of the first dielectric layer.

18. The method of claim 1 wherein the introducing forms a barrier layer including the diffusion barrier material in an upper portion of the first dielectric layer.

19. The method of claim 1 further comprising:

forming a layer of gate material over the second dielectric layer;

patterning the layer of gate material to form a gate from the layer of gate material, the gate located over the second dielectric layer.

20. A method comprising:
forming a first dielectric layer including silicon oxide over semiconductor material including silicon;
introducing nitrogen into the first dielectric layer;
forming a second dielectric layer over the first dielectric layer after the introducing, the second layer including silicon nitride; and
forming a layer of gate material over the second dielectric layer.

21. The method of claim 20 wherein the introducing further includes:
performing a plasma nitridation process.

22. The method of claim 21 wherein the plasma nitridation process is characterized as a remote plasma nitridation process.

23. The method of claim 20 wherein the introducing further includes:
implanting nitrogen into the first dielectric layer.

24. The method of claim 23 wherein the introducing further includes:
annealing the first dielectric layer after the implanting.

25. The method of claim 20 wherein the introducing further includes:
flowing a nitrogen bearing gas over the first dielectric layer and then annealing the first dielectric layer.

26. The method of claim 20 wherein after the introducing, the nitrogen has a gradual gradient profile in the first dielectric layer.

27. The method of claim 20 wherein after the introducing, a bottom portion of the first dielectric layer has lower concentration of nitrogen than an upper portion of the first dielectric layer.

28. The method of claim 20 wherein the introducing forms a barrier layer of silicon nitride in an upper portion of the first dielectric layer.

29. The method of claim 20 further comprising:
patterning the layer of gate material to form a gate from the layer of gate material, the gate being located over the second dielectric layer.

30. A semiconductor device comprising:
semiconductor material;
a first dielectric layer located over the semiconductor material, wherein the first dielectric layer includes a diffusion barrier material having a gradual gradient profile and having a higher concentration is an upper portion of the first dielectric layer and a low concentration in a lower portion of the first dielectric layer;
a second deictic layer located over the first dielectric layer; and
a gate located over the second dielectric layer.

31. The device of claim 30 wherein the diffusion layer material includes nitrogen.

32. The device of claim 30 wherein the second dielectric layer is a relatively higher K dielectric than the first dielectric layer.

33. The device of claim 30 wherein the semiconductor material includes silicon.

34. The device of claim 33 wherein the semiconductor material includes at least one of single crystal silicon, strained silicon, and silicon germanium.

35. The device of claim 30 wherein the first dielectric layer includes silicon oxide.

36. The device of claim 30 wherein the first dielectric layer includes at least one of germanium oxide and silicon germanium oxide.

37. The device of claim 30 wherein the second dielectric layer includes silicon nitride.

38. The device of claim 30 wherein the second dielectric layer includes at least one of one of germanium nitride and silicon germanium nitride.

39. The device of claim 30 wherein the second dielectric layer includes a high K dielectric.

40. The device of claim 30 wherein the high K dielectric includes at least one of a metal oxide, a metal silicate, a metal oxynitride, and a metal silicon oxynitride.

41. The device of claim 40 wherein:

the metal oxide includes at least one of hafnium oxide, aluminum oxide, lanthanum oxide, titanium oxide, and tantalum oxide;

the metal silicate includes at least one of hafnium silicate, aluminum silicate, lanthanum silicate, titanium silicate, and tantalum silicate;

the metal oxynitride includes at least one of hafnium oxynitride, aluminum oxynitride, lanthanum oxynitride, titanium oxynitride, and tantalum oxynitride; and

the metal silicon oxynitride includes at least one of hafnium silicon oxynitride, aluminum silicon oxynitride, lanthanum silicon oxynitride, titanium silicon oxynitride, and tantalum silicon oxynitride.

42. The device of claim 30 further comprising:

a barrier layer located in an upper portion of the first dielectric layer, the barrier layer including the diffusion barrier material.